

(1) "The Color Names Dictionary" in *Color: Universal Language and Dictionary of Names*, National Bureau of Standards Special Publication 440, December 1976.

(2) "Development of a Laboratory Test for Evaluation of the Effectiveness of Smoke Signals," National Bureau of Standards Report 4792, July 1956.

(b) NBS Special Publication 440 may be obtained by ordering from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (Order by SD Catalog No. C13.10:440).

(c) NBS Report 4792 may be obtained from the Commandant (G-MSE), U.S. Coast Guard, Washington, DC 20593-0001.

(d) Approval to incorporate by reference the materials listed in this section was obtained from the Director of the Federal Register on November 1 and 29, 1979. The materials are on file in the Federal Register library.

[CGD 76-048a and 76-048b, 44 FR 73091, Dec. 17, 1979, as amended by CGD 82-063b, 48 FR 4782, Feb. 3, 1983; CGD 88-070, 53 FR 34536, Sept. 7, 1988; CGD 95-072, 60 FR 50467, Sept. 29, 1995; CGD 96-041, 61 FR 50733, Sept. 27, 1996]

§ 160.057-2 Type.

(a) Floating orange, smoke distress signals specified by this subpart shall be of one type which shall consist essentially of an outer container, ballast, an air chamber, an inner container, the smoke producing composition, and an igniter mechanism. Alternate arrangements which conform to the performance requirements of this specification will be given special consideration.

(b) [Reserved]

§ 160.057-3 Materials, workmanship, construction, and performance requirements.

(a) *Materials.* The materials shall conform strictly to the specifications and drawings submitted by the manufacturer and approved by the Commandant. Metal for containers shall be not less than 0.5 mm (0.020 in.) in thickness. Other dimensions or materials may be considered upon special request when presented with supporting data. Igniter systems shall be of corrosion-resistant metal. The com-

bustible material shall be of such nature that it will not deteriorate during long storage, nor when subjected to frigid or tropical climates, or both.

(b) *Workmanship.* Floating orange smoke distress signals shall be of first class workmanship and shall be free from imperfections of manufacture affecting their appearance or that may affect their serviceability.

(c) *Construction.* The outer container shall be cylindrical and of a size suitable for intended use. All sheet metal seams should be hook jointed and soldered. The whole container shall be covered with two coats of waterproof paint or other equivalent protection system. The igniter mechanism shall operate and provide ignition of the signal automatically when the ring life buoy to which it is attached is thrown overboard.

(d) *Performance.* Signals shall meet all the inspection and test requirements contained in § 160.057-4.

§ 160.057-4 Approval and production tests.

(a) *Approval tests.* The manufacturer must produce a lot of at least 20 signals from which samples must be taken for testing for approval under § 160.057-7. The approval tests are the operational tests and technical tests in paragraphs (c) and (d) of this section. The approval tests must be conducted by an independent laboratory accepted by the Commandant under § 159.010 of this chapter.

(b) *Production inspections and tests.* Production inspections and tests of each lot of signals produced must be conducted under the procedures in § 159.007 of this chapter. Signals from a rejected lot must not be represented as meeting this subpart or as being approved by the Coast Guard. If the manufacturer identifies the cause of the rejection of a lot of signals, the signals in the lot may be reworked by the manufacturer to correct the problem. Samples from the rejected lot must be retested in order to be accepted. Records shall be kept of the reasons for rejection, the reworking performed on the rejected lot, and the results of the second test.

(1) *Lot size.* For the purposes of sampling the production of signals, a lot

must consist of not more than 1,200 signals. Lots must be numbered serially by the manufacturer. A new lot must be started with: (i) Any change in construction details, (ii) any change in sources of raw materials, or (iii) the start of production on a new production line or on a previously discontinued production line.

(2) *Inspections and tests by the manufacturer.* The manufacturer's quality control procedures must include inspection of materials entering into construction of the signals and inspection of the finished signals, to determine that signals are being produced in accordance with the approved plans. Samples from each lot must be tested in accordance with the operational tests in paragraph (c) of this section.

(3) *Inspections and tests by an independent laboratory.* An independent laboratory accepted by the Commandant under § 159.010 of this chapter must perform or supervise the inspections and tests under paragraph (b)(2) of this section at least 4 times a year, unless the number of lots produced in a year is less than four. The inspections and tests must occur at least once during each quarterly period, unless no lots are produced during that period. If less than four lots are produced, the laboratory must perform or supervise the inspection and testing of each lot. In addition, the laboratory must perform or supervise the technical tests in paragraph (d) of this section at least once for every ten lots of signals produced, except that the number of technical tests must be at least one but not more than four per year. If a lot of signals tested by the independent laboratory is rejected, the laboratory must perform or supervise the inspections and tests of the reworked lot and the next lot of signals produced. The tests of each reworked lot and the next lot produced must not be counted for the purpose of meeting the requirement for the annual number of inspections and tests performed or supervised by the independent laboratory.

(c) *Operational tests.* Each lot of signals must be sampled and tested as follows:

(1) *Sampling procedure and accept/reject criteria.* A sample of signals must be selected at random from the lot. The

size of the sample must be the individual sample size in Table 160.057-4(c)(1) corresponding to the lot size. Each signal in the sample is tested as prescribed in the test procedure in paragraph (c)(2) of this section. Each signal that has a defect listed in the table of defects (Table 160.057-4(c)(2)) is assigned a score (failure percent) in accordance with that table. In the case of multiple defects, only the score having the highest numerical value is assigned to that signal. If the sum of all the failure percents (cumulative failure percent) for the number of units in the sample is less than or equal to the accept criterion, the lot is accepted. If this sum is equal to or more than the reject criterion the lot is rejected.

If the cumulative failure percent falls between the accept and reject criteria, another sample is selected from the production lot and the operational tests are repeated. The cumulative failure percent of each sample tested is added to that of the previous samples to obtain the cumulative failure percent for all the signals tested (cumulative sample size). Additional samples are tested and the tests repeated until either the accept or reject criterion for the cumulative sample size is met. If any signal in the sample explodes when fired, or ignites in a way that could burn or otherwise injure the person firing it, the lot is rejected without further testing. (This procedure is diagrammed in figure 160.057-4(c)).

(2) *Test procedure.* Each sample signal (specimen) must be tested as follows:

(i) *Conditioning of test specimens—water resistance.* Immerse specimen horizontally with uppermost portion of the signal approximately 25 mm (1 in.) below the surface of the water for a period of 24 hours.

(ii) *Smoke emitting time.* Ignite specimen according to the directions printed on the signal and place signal in tub or barrel of water. The smoke emitting time of a specimen shall be obtained by stop watch measurements from the time of distinct, sustained smoke emission until it ceases. There shall be no flame emission during the entire smoke emitting time of the signal. The smoke emitting time for a specimen shall not be less than 15 minutes. When the tests are performed or supervised

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by an independent laboratory, this test shall be conducted with approximately 6 mm (¼ in.) of gasoline covering the water in the tub or barrel. The gasoline vapors shall not ignite during the entire smoke emitting time of the signal.

(iii) *Ignition and smoke emitting characteristics.* Test specimens shall ignite and emit smoke properly when the directions on the signal are followed. Test specimens shall not ignite explosively in a manner that might be dangerous to the user or persons close by. Test specimens shall emit smoke at a uniform rate while floating in calm to rough water. Signals should be so constructed that water submerging the signal in moderately heavy seas will not cause it to become inoperable.

TABLE 160.057-4(C)(1)—ACCEPT AND REJECT CRITERIA FOR OPERATIONAL TEST LOTS

Lot size	Individual sample size	Sample	Cumulative sample size	Accept ¹	Reject ¹
150 or less.	2	First	2	(²)	200
		Second	4	(²)	200
		Third	6	0	200
		Fourth	8	0	300
		Fifth	10	100	300
		Sixth	12	100	300
		Seventh	14	299	300
151 to 500.	3	First	3	(²)	200
		Second	6	0	300
		Third	9	0	300

TABLE 160.057-4(C)(1)—ACCEPT AND REJECT CRITERIA FOR OPERATIONAL TEST LOTS—Continued

Lot size	Individual sample size	Sample	Cumulative sample size	Accept ¹	Reject ¹
More than 501.	5	Fourth	12	100	400
		Fifth	15	200	400
		Sixth	18	300	500
		Seventh	21	499	500
		First	5	(²)	300
		Second	10	0	300
		Third	15	100	400
		Fourth	20	200	500
		Fifth	25	300	600
		Sixth	30	400	600
		Seventh	35	699	700

¹ Cumulative failure percent.

² Lot may not be accepted. Next sample must be tested.

TABLE 160.057-4(C)(2)

Kind of defects	Percentage of failures
a. Failure to ignite	100
b. Ignites or burns dangerously	100
c. Nonuniform smoke emitting rate	50
d. Smoke-emitting time less than 70 percent of specified time	100
e. Smoke-emitting time at least 70 percent but less than 80 percent of specified time	75
f. Smoke-emitting time at least 80 percent but less than 90 percent of specified time	50
g. Smoke-emitting time at least 90 percent but less than 100 percent of specified time	25

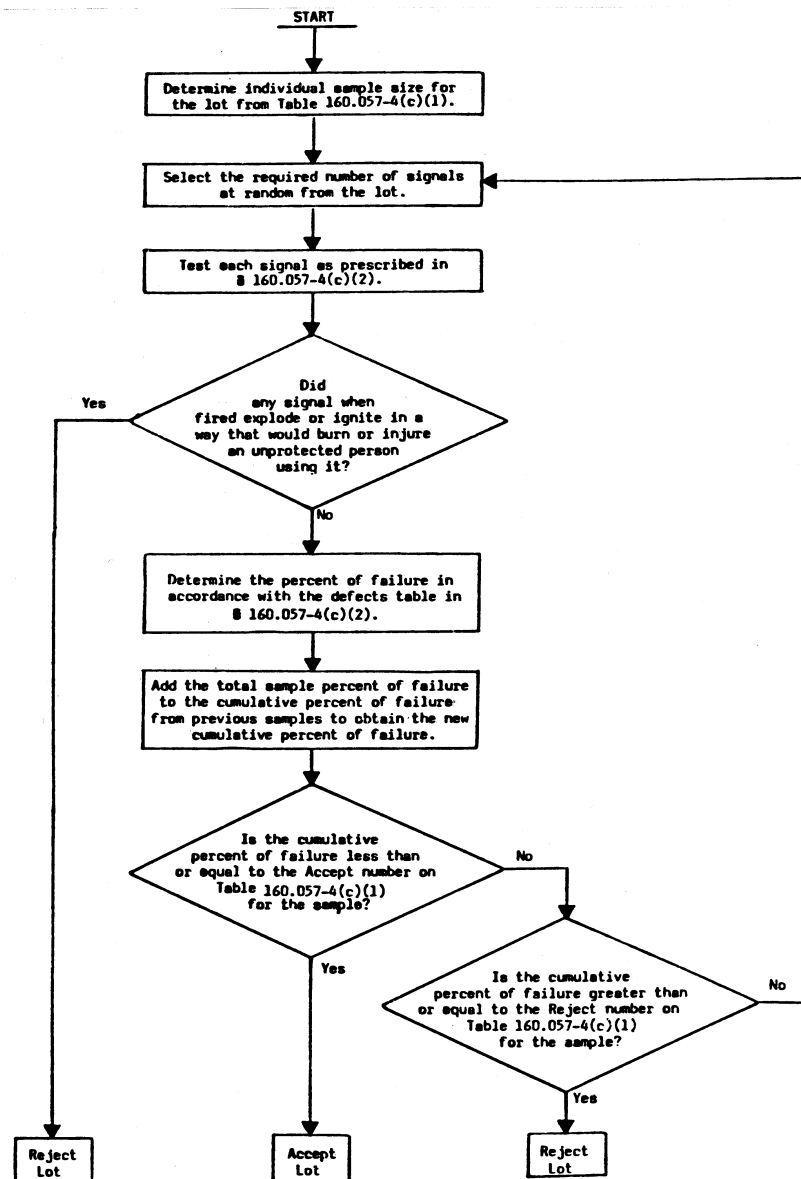


Figure 160.057-4(c). Operational test procedure.

(d) *Technical tests.* One signal must be subjected to each of the following tests. Each signal must pass the test in

order for the lot of signals to be accepted.

(1) *Drop test.* One signal must be attached to a ring life buoy and arranged

to be ignited by the dropping buoy in the same manner as it would be when used on a vessel. The signal and buoy must be mounted at least 27 m (90 ft.) above the surface of a body of water. The buoy is released and must cause the signal to ignite and fall to the water with the buoy. The signal must remain afloat and emit smoke at least 15 minutes.

(2) *Wave test.* A signal shall be tested in a manner simulating its use at sea. The signal shall be ignited and thrown overboard under conditions where waves are at least 30 cm (1 ft.) high. The smoke emitting time must be for the full 15 minutes and the signal shall float in such a manner that it shall function properly during this test. The signal shall be attached to a ring life buoy in accordance with the manufacturer's instructions.

(3) *Underwater smoke emission.* Condition the signal in accordance with paragraph (c)(2)(i) of this section. Ignite specimen and let it burn about 15 seconds in air. Submerge the burning signal in water in a vertical position with head down. Obtain underwater smoke emission time by stop watch measurements from time of submersion until smoke emission ceases. The test specimen shall emit smoke under water not less than 30 seconds when subjected to this test.

(4) *Elevated Temperature, Humidity and Storage.* Place specimen in a thermostatically controlled even-temperature oven held at 75 °C. with not less than 90 percent relative humidity for 72 hours. Remove specimen and store at room temperature (20° to 25 °C.) with approximately 65 percent relative humidity for 10 days. If for any reason it is not possible to operate the oven continuously for the 72-hour period, it may be operated at the required temperature and humidity for 8 hours out of each 24 during the 72-hour conditioning period. (Total of 24 hours on and 48 hours off.) The signal shall not ignite or decompose during this conditioning. The signal shall ignite and operate satisfactorily following this conditioning.

(5) *Spontaneous ignition.* Place the specimen in a thermostatically controlled even-temperature oven held at 75 °C. with not more than 10% relative

humidity for 48 consecutive hours. The signal must not ignite or undergo marked decomposition.

(6) *Susceptibility to explosion.* Remove smoke composition from signal and punch a small hole in the composition. Insert a No. 6 commercial blasting cap. Ignite the cap. The test specimen shall not explode or ignite.

(7) *Corrosion resistance.* Expose the complete specimen with cover secured hand-tight to a finely divided spray of 20 percent by weight sodium chloride solution at a temperature between 32 °C and 38 °C (90 °F and 100 °F) for 100 hours. The container and cap must not be corroded in any fashion that would impair their proper functioning.

(8) *Color of smoke.* Ignite specimen in the open air in daytime according to the directions printed on the signal, and determine the smoke color by direct visual comparison of the unshadowed portions of the smoke with a color chart held so as to receive the same daylight illumination as the unshadowed portions of the smoke. The color of the smoke must be orange as defined by sections 13 and 14 of the "Color Names Dictionary" (colors 34-39 and 48-54).

(9) *Volume and density of smoke.* The test specimen shall show less than 70 percent transmission for not less than 12 minutes when measured with apparatus having a light path of 19 cm (7½ in.), an optical system aperture of +3.7 degrees, and an entrance air flow of 18.4m³ per minute (650 cu. ft. per minute), such apparatus to be as described in National Bureau of Standards Report No. 4792.

§ 160.057-5 Marking.

(a) *Directions for use.* Each floating orange smoke distress signal shall be plainly and indelibly marked in black lettering not less than 3 mm (⅛ in.) high "Approved for daytime use only", and in black lettering not less than 5 mm (⅜ in.) high with the word "Directions". Immediately below shall be similarly marked in black lettering not less than 3 mm (⅛ in.) high in numbered paragraphs, and in simple and easily understood wording, instructions to be followed to make the device operative. Pasted-on labels are not acceptable.